

“Suffering Waters” on the Urban Landscape

Decades of research shows that urbanization has degraded our water resources in many ways. But you don't have to be a scientist to confirm it. Across the country, the casual observer can't help but notice that lakes and streams in highly populated areas are suffering badly.

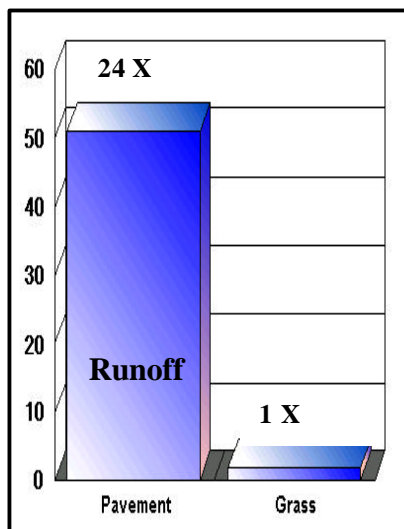
In Southeast Wisconsin, a 30-minute drive toward Milwaukee from any direction would bring this fact to light. If you took note of the look of the streams along the way, you would discover an “evolution” that occurs as you leave the farmland and open space and gradually become surrounded by rooftops and parking lots. This fact sheet takes a closer look at that evolution process and the signs of "suffering waters" on our urban landscape. It also outlines some actions that can be taken to mitigate the problem, as well as to prevent it from occurring in the first place.



"Impervious" Beginnings

Studies show that buildings and pavement are at the core of the negative impacts urbanization has had on our lakes and streams. In fact, you may be surprised that these impacts begin when as little as 10% of the drainage area, or watershed is covered by these impervious surfaces.

The key word here is *impervious* - rooftops, roads, driveways, parking lots, etc. They all prevent rain and melting snow from soaking into the soil surface, resulting in increased runoff from the landscape. But, that is just the beginning of the story of how urbanization affects our water resources.



The “Hard” Facts on Urban Runoff

1½” rain - Pavement produces 24 times more runoff than grass!

The Numbers:

Grass runoff fills a 10' x 10' room about knee high (2.2').

Pavement runoff fills the same room almost 6 stories high (52')!



The Underground Connection

Storm sewers are also an important factor in the story of degraded urban waters. During a rain or snowmelt period, this highly efficient network of curbside drains and pipes beneath our streets quietly collects runoff from our lawns, shopping

centers and industrial parks. When they work correctly, the sewers quickly “dispose” the unwanted runoff to the nearest lake, stream or wetland - untreated. Upstream, this process pretty much occurs “out of sight and out of mind”. Downstream, it is a very different story.

“Growing” Streams

Vast impervious surfaces, teamed up with the storm sewers that quickly drain them, produce unnatural downstream flows that are:

- 1) much larger volumes of water,
- 2) moving much faster, and
- 3) occurring far more often.

Eroding streambanks are a common early symptom of a stream that is getting “too big for its britches.” In other words, it can no longer handle the increased flows coming off the urban landscape during runoff events, so it naturally tries to widen itself. Rock riprap, concrete and other bank reinforcement measures are often used to try to stop the streambanks from eroding.



Complaints of gully erosion or increased wetness in downstream farm fields are also indicators of the unnatural flows produced from urban landscapes.

High Water Headaches

When a heavy rain or quick snowmelt occurs, a stream naturally overflows its banks into an established floodplain area. But as the watershed keeps developing, flows increase and the floodplain may be *expanding*.

Early signs are when the water reaches flood levels more often than they are “supposed to”. But if a rare storm hits the area, watch out! Calling something a 100 or 500-year event does little to relieve the damage to homes and businesses - or prevent it from happening again.

A common practice used to address this problem in the past was the straightening, deepening and widening of streams - often leading to the entire channel being lined with concrete. These are very common in the Milwaukee area. They help carry more water away faster without channel erosion, but leave the stream lifeless and not real pretty. They also may only transfer or even compound the problems downstream.



“Disappearing” Streams

While it is common for urban streams to swell quickly during a heavy rain, it is also common - especially for smaller tributary streams - for flows to quickly “disappear” between storms. This is called losing “base flow”. It means that the local groundwater is no longer being replenished enough to maintain the stream flows that may have existed before the landscape was developed.

Impervious surfaces, storm sewers and engineered grading prevent water from getting trapped in small natural depressions and slowly seeping through the soil to replenish the groundwater. Instead, it quickly runs off, picking up a smorgasbord of pollutants along the way.

The Dirty Facts

And that leads us to perhaps the most disturbing part of this story - the impacts urbanization has on water quality. Decades of monitoring provide us with a very long and predictable list of sediment, nutrients, metals, hydrocarbons, and other toxins that flow at alarming rates from our urban areas every time it rains. Here are a just few examples of the types and amounts of pollutants that storm sewers commonly carry to our lakes and streams.

- For every 10 acres of land that is under construction, an average of 15 dump truck loads of eroded soil ends up in our waters.
- Lawn grass is now the number one crop in the nation and urbanites apply fertilizers and pesticides at rates 10 times that of farmers.
- Urban runoff almost always exceeds human contact standards for fecal coliform bacteria counts - usually 20 to 40 times the health standard!
- Careless dumping and leaky engines cause *more* motor oil and antifreeze to flow into our nations waters from storm sewers each year than is spilled in tanker accidents.



The Net Result

Researchers have found that by the time a watershed is a 25% impervious, stream and lakes are usually beyond hope - no longer able to support the diverse aquatic life found in healthy waters. The impacts do not happen over night, but are more chronic in nature. Hundreds of storm sewers or road ditches discharging polluted runoff dozens of times each year slowly take their toll on the fragile aquatic ecosystem.

Algae blooms, excessive weed growth and the odor of decaying organic matter are some of the symptoms noticeable to the average passerby. Below the water line, the desirable fish species slowly migrate out of the area as their food supply, oxygen levels and habitat are degraded. Tolerant species like carp slowly take over and add to the problem by constantly stirring up the bottom sediments.

In short, urban waters are usually suffering.



Creative Planning is Key to Protecting Our Waters

The problems described above, while all too common in urban areas, are *not* the inevitable price of progress. There are a wide variety of actions that can be taken by planners, developers, engineers, public officials and citizens to protect our water resources from the negative impacts of urbanization. Creative planning is the key behind all of them. Here are some "*guiding principles*" for urban runoff management planning and some examples of how they can be applied:

1. Preserve Open Space & Drainageways

Identify and preserve natural drainageways, shorelands, woodlands and wetlands. These areas help absorb and filter urban runoff. Provide vegetated buffer strips along shorelands and natural drainageways. Multistory structures and condensed site planning can also save open space.

2. Maximize Infiltration & Filtering

Use grass swales to carry stormwater runoff instead of curb and gutters where possible. Direct downspouts and low use pavement areas to gravel infiltration trenches or basins. Design parking lots to "sheet drain" to lawns or other vegetated areas. Use native prairie species in landscape plans – for deeper roots and better infiltration. Identify internally drained areas and preserve for groundwater recharge. Use pervious surfacing materials such as reinforced turf and special pavers for overflow parking, patios, driveways and low use areas.



3. Minimize Roof & Pavement Areas

Put maximum impervious limits in zoning. Reduce road lengths through efficient layouts, cluster zoning or planned unit developments. Allow for sidewalks on one side of the street and narrower roads in low traffic areas. Use cul-de-sacs with vegetated centers. Encourage shorter and narrower driveways. Reduce parking lot size requirements.

4. Treat Stormwater Before Discharging

Reserve space for wet detention basins and constructed wetlands, which work best for trapping sediment and the many pollutants that are attached. Install infiltration practices at the basin discharge for additional downstream protection. Require provisions for access and future maintenance.



5. Control Erosion During Construction

Avoid steep slopes. Minimize the disturbed area and the time the soil is exposed. Sequence construction, plant temporary cover for large areas, install sediment traps and basins to treat runoff. Complete final grading, seeding and landscaping in a timely manner. Schedule work around the growing season if possible.

Watershed Protection Planning

The best way to implement these principles is through “watershed protection planning”. This is where the entire drainage area of a lake or stream is studied. Growth in the watershed is projected, natural features identified for protection and an intergovernmental plan for land use and regional stormwater management practices is prepared, with protecting water quality as a primary goal.

Stormwater planning by watershed is fairer and more cost effective than handling it site-by-site. However, since watersheds rarely follow land ownership or political boundaries, it also poses some significant challenges. Cooperation among local governments is a must to make it work.

A watershed protection plan doesn't impede development - it just minimizes the negative impacts. In fact, many of the guiding principles cost less than current zoning and engineering standards. Creativity in site planning is critical.

The map to the right is taken from an example of this type of planning that is underway in Washington County for the Quaas Creek watershed. It is a rare trout stream that is right in the middle of a high growth area of the county. It reflects a common political situation for watersheds – having five units of government involved. (A similar project is getting underway in Waukesha County in 2002 for the Pebble Creek watershed.)

Getting communities to work together on such a plan is a huge step. The next challenge is plan implementation. Some of the tools used to implement a watershed protection plan include: zoning, easements, deed restrictions, revised development and landscape standards, dedications, purchase/transfer of development rights, cluster subdivisions, stormwater utility fees and intergovernmental agreements. Developing and implementing a watershed protection plan requires commitment from all involved, but offers huge payback in the long haul - healthy water resources.

